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if he banish empirical teleology from his universe of discourse would seem to be under an equally dialectical necessity of saying just the reverse.

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REVIEWS AND ABSTRACTS OF LITERATURE

The Fitness of the Environment: An Inquiry into the Biological Significance of the Properties of Matter. LAWRENCE J. HENDERSON. New York: The Macmillan Company. 1913. Pp. xi + 317.

"To what extent do the characteristics of matter and energy and the cosmic processes favor the existence of mechanisms which must be complex, highly regulated, and provided with suitable matter and energy as food? If it shall appear that the fitness of the environment to fulfill these demands of life is great, we may then ask whether it is so great that we can not reasonably assume it to be accidental, and finally we may inquire what manner of law is capable of explaining such fitness of the very nature of things" (p. 37). This is Professor Henderson's statement of his problem. The origin of the problem in the author's mind was the connection between physical and chemical properties of simple substances, and the organic functions which they serve. The key to the peculiar conditions of equilibrium between acids and bases in blood and protoplasm is to be found in certain characteristics of phosphate solutions and of similar solutions containing carbonic acid. Of all known substances, phosphoric acid and carbonic acid possess the greatest power of automatic regulation of neutrality.

"One does not like to accept a fact of such far-reaching importance as mere chance, and yet no other explanation was at hand. . . . Natural selection could not be involved. . . . But . . . this is no unique instance of a property of a simple substance automatically serving a very useful purpose in the processes of life.

"Then . . . came the realization of the reciprocal character of Darwinian fitness, and at once the whole difficulty was resolved."

After two chapters, one on "Fitness," the other on "The Environment," in which the nature of the problem and the proposed solution are discussed, the book takes a view of the essential physical and chemical constitution of the universe considered in its aspect as environment of life; this on the one hand; and, on the other, postulating certain essential characteristics of life, it interprets the mutuality of the fact of fitness between environment and life as genuine reciprocity or essential coimplication between them. The characteristics of life which are singled out as useful for the argument and at the same time as fundamental are these: life is a physico-chemical mechanism essentially complex in structure and function, durable (and therefore regular and regularly conditioned) and active (metabolic) (pp. 31, 32).

The physico-chemical characteristics of water, carbonic acid, and the carbon compounds are taken up one by one and their absolute and relative magnitudes considered. The possible utility of such properties is then estimated. Finally, the various favorable qualities of water, carbonic acid, and the carbon compounds are grouped together to see if they constitute a unique *ensemble* of fitness, among all possible substances, for a living organism. This evidence, in the main, constitutes Chapters III., IV., V., and VI. Chapter VII. concisely analyzes and summarizes the evidence, and the last chapter, Chapter VIII., entitled "Life and the Cosmos," draws the author's metaphysical conclusions concerning the nature of the evolutionary process, with discussions of vitalism and Bergson's evolutionism.

The wonder of life's mastery of its conditions seems, to those who have best expressed themselves about it, to consist essentially in the incredible ingenuity either of life itself or of an artificer who could have preestablished such an infinitely complex and admirable fitness between life and its conditions. Certainly life, even in lower forms, does not merely conform to its conditions, as in the development of cunningly suitable anatomy; the mastery includes more lordly methods, the reforming of conditions to suit life. But no matter—the wonder in both cases alike is the infinite ingenuity manifested; for even in bridling nature the successfulness of it always corresponds exactly to the degree of insight into nature. Life stoops, in this sense, even to conquer. Whether the miracle comes to one emotionally, as it comes to the blessed children of Kipling's and of Stevenson's creation, who cry, "The world is so full of a number of things, I'm sure we should all be as happy as kings," and exult in the provision by good Mother Nature for such diverse wants of so many creatures; or whether the miracle engages the intellect rather, the miraculous thing is always the intricacy of the correspondence between life and its conditions.

Henderson, like Bergson, conceives that this marvel gets its marvelousness from a false way of distinguishing between life and its conditions. Life's actual taking form in living beings,—in other words, the fact of organization—as Bergson shows, has a difference from manufacture (of a machine, for instance), a difference which takes from biological fitness all ingenuity, even of a Creator. For a manufacturing Creator were ingenious (as Mother Nature is regarded by the Kipling nurse in the song) only if God, like Mother Nature, is supposed to *make* things, to build them. " . . . The creation of the visual apparatus is no more explained by the assembling of its anatomic elements than the digging of a canal could be explained by the heaping-up of the earth which might have formed its banks. . . . When we wonder at the marvelous structure of an instrument such as the eye, at the bottom of our wondering is always this idea, that it would have been possible for *a part only* of this coordination to have been realized, that the complete realization is a kind of special favor. . . . We see something positive in this coordination, and consequently something fractionable in its cause,—something which admits of every possible degree of achievement. In reality, the cause, though more or less intense, can not produce its effect except in one piece, and completely finished. According as it goes further in the direction of vision, it" [produces a more complex structure]. "For the form of the organ only expresses the degree in which the exercise of the function has been obtained."[1]

Bergson's conception of the meaning of structural determination is that it is an expression or translation in negative or inverse, of function. But he vacillates, with confusing results, between a reciprocity of two mutually alien orders of energy (life and inert matter), on the one hand, and the denial of matter, on the other. Henderson's use of the conception of reciprocity is clearer. If life and matter are mutual inversions, the relationship is a mystery, on Bergson's principles, a mystery of the vicious, hopeless sort which is neither original nor analogical—it is not ultimate, yet is has no leading for thought. It is either the Platonic interactiveness between being and non-being, or else it is the Cartesian irreducible dualism whose discovery is due to the necessity of reducing it. Henderson's idea is that, in metabolism, we have not two principles (one real and the other unreal, according to Bergson!) one of which, positive reality, life, impresses itself upon, or expresses itself by means of, the other, inert matter; the manifestations of energy are not independent of each other. Energy is one. The properties of matter, and the course of cosmic evolution, are so intimately related to the structure of the living being and to its activities that the whole evolutionary process, both cosmic and organic, is one, and the biologist may rightly regard the universe in its very essence as biocentric. This implies not only that one may learn the true nature of the universe from the biological point of view, as the environment fit for life, as well as learn the true nature of the organism from the evolutionary point of view as the agent fitted to exploit its environment; it implies a profounder idea, namely, that a teleological tendency works steadily through the whole process of evolution, a tendency at the very origin of things, a necessary associate of mechanism. Matter and energy have an original property, assuredly not by chance, which *organizes* the universe.

I say this is preferable to Bergson's conception of evolutionary process because whatever dualism it involves, between matter and purpose, is an aspective and not an ontological dualism. If it is a mystery that teleology should be a " necessary associate " of mechanism, it is an *original* mystery, precisely like the mystery that the east is a necessary associate of the west. It means that, when you contemplate the nature of the concept " mechanism " or of the concept " teleology," with thoroughgoing, persistent attention to its necessary implications, you find in each the other necessarily implied, as you find the east necessarily implied in what you mean by the west.

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The Masters of Modern French Criticism. IRVING BABBITT. Boston and New York: Houghton Mifflin Company. 1912. Pp. xi + 427.

This is a dignified and important book, and deserves a high welcome: all the more when we contrast its style, its interest in ideas, and its width

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[1] Bergson's "Creative Evolution," pages 93-96.